AN EVALUATION OF LAND RESERVES
FOR CONTROLLING AGRICULTURAL PRODUCTION

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INTRODUCTION

For eighteen consecutive years, 1956-73, varying amounts of U. S. cropland were idled from the production of farm commodities. Popular terms for specific programs or particular provisions of commodity programs included soil bank, acreage reserve, conservation reserve, cropland adjustment, cropland conversion, diversion, and set-aside. Acreage levels idled under these various programs exceeded 60 million acres in 1962, 1966, and 1972. Farm programs have been in effect since 1973, but have used no land idling provisions.[1]

The major purpose for the land idling programs and provisions was to reduce the production of wheat, feed grains, and cotton. The acreage reserve, diversion, and set-aside programs were annual programs where the land withdrawn was committed to non-production use for one year at a time. The other programs allowed longer term commitments ranging up to 10 years, and allowed whole farms to be retired in some cases. While these longer term programs were primarily aimed at reducing crop

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[1] Some land contracted under the cropland adjustment program was not due to expire until after 1974. But, after 1973 farmers were allowed to break the contract if they wished. Approximately 2 million acres remained under contract in 1974.

production, a secondary objective was to promote permanent conversion from crop use to pasture or forest uses, especially in cases where the land was marginally suited for grain crop use.

The purpose of this paper is to examine the effectiveness of land idling programs in reducing crop acres and relate the effectiveness to the underlying mechanism for administering the programs. The slippage problem is treated first and then rigidities in production adjustment introduced by allotments and bases are discussed. An alternative plan for administering land reserve[2] programs is suggested and briefly elaborated.

Information in this paper may be pertinent if future conditions require policymakers to again consider land reserve as a policy instrument for effecting production control. Treatment of this topic does not imply that land reserve is superior to other instruments for effecting supply control, nor is there any discussion of the probability that some form of supply control may be needed in the future.

THE SLIPPAGE ISSUE

Slippage Concepts

Slippage is a term often discussed in connection with the performance of land reserve in achieving the supply objective. It may be illustrated as follows. Let A_1^{h*} represent the acreage of crop 1 that farmers would harvest under a given set of program provisions without land reserve. Let

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[2] Throughout the remainder of the paper, the term land reserve will be used to describe land withheld from production through programs whose primary objective is supply reduction.

A_1^h represent the actual acreage of crop 1 harvested under the same program with land reserve. Let L_1 equal the acreage of land designated as crop 1 land reserve. Harvested acre slippage for crop 1, S_1^h, is defined as:

$$S_1^h = 1.0 - \{(A_1^h* - A_1^h) \div L_1 \} \quad (1)$$

If $S_1^h = 0$, it means that crop acreage was reduced by one acre for each acre of land reserve, L_1. If $S_1^h = 1$ it would mean that the land reserve had no effect on the acreage of the crop.

Now let Y_1^h* be the yield that would have resulted with A_1^h* acres and Y_1^h be the actual harvested acre yield. Under these conditions production slippage, S_1^p, for crop 1, would be defined as:

$$S_1^p = 1.0 - (\{(A_1^h* \cdot Y_1^h*) - (A_1^h \cdot Y_1^h) \} \div \{L_1 \cdot Y_1^h*\}) \quad (2)$$

The objective of land reserve programs is to control production by limiting the land input, thus the reason for the definition of slippage on the basis of production. The implication of production slippage greater than acreage slippage ($S_1^p > S_1^h$) is that the acreage placed in land reserve is less productive than the land remaining in production of crop 1. Another factor relating to yields is that yields may increase ($Y_1^h > Y_1^h*$) because farmers apply inputs more intensively to the remaining land they are allowed to use for production. Values for S_1^h and S_1^p cannot be readily estimated because values for A_1^h* and Y_1^h* are not known. Estimates of A_1^h, Y_1^h, and L_1 are reported.

Slippage equations (1) and (2) are developed on the basis of total acreage of crop 1 when in practice land reserve occurs only on participating farms which represent some fraction of the total. A slippage

coefficient calculated on the basis of participants only may be different from a coefficient calculated for all farms. Non-participating farmers may feel the existence of a land reserve program has a positive influence on expected price of the particular commodity and therefore increase their acreage of the crop in response to a land reserve program. If this were the case, the slippage coefficient for all farms would be greater than the coefficient for participating farms only.

The slippage equations have been defined for one crop. A land reserve aimed at a particular crop may affect other crops that may or may not have separate land reserve programs. For instance, the value of A_2^h* for crop 2 may be different than the value of A_2^h given a land reserve program for crop 1 indicating a cross effect.

A net harvested acre slippage coefficient can be defined by looking at the total land reserve acreage and the total acreage of all crops as defined in the following equation:

$$S^h = 1.0 - \{(\sum_{i=1}^{n} A_i^h* - \sum_{i=1}^{n} A_i^h) \div \sum_{i=1}^{n} L_i \} \qquad (3)$$

A net production slippage coefficient has not been defined because of the difficulty of summing across different commodities.

It is evident from observation of farm program performance with respect to land reserve programs that slippage coefficients as defined in equations (1), (2), and (3) have a positive value. A positive slippage value is viewed as undesirable for the following reasons:

1. Acreage in land reserve status may be viewed as an intermediate term food reserve by policy planners, domestic consumers, and foreign customers. It is quite tempting to assume that each land reserve acre for crop i can provide a future production increment, if needed, equal to an acre producing crop i. If there is a large

production slippage coefficient the actual reserve may be much less than the implied reserve thus resulting in a false sense of security.

2. From the individual farmer standpoint the existence of positive slippage coefficients means that there are farmers whose level of program performance is not commensurate with the intent of the provisions. Farmers whose situation results in slippage can usually meet the land reserve requirements without having to reduce the acreage of their most profitable crop proportionally to the required land reserve acreage. Slippage as discussed here is not a result of fraud or willful disregard of rules, but rather bona-fide situations that result within program provision rules. This not only results in farmers receiving production adjustments payments for less than full performance but also tends to defeat the purpose of the program in the aggregate. One result is inequity among farmers because not all farmers have situations conducive to slippage. Another is that the cost effectiveness of the program may be reduced from what it could be under conditions of no slippage.

Estimates of Slippage

Garst and Miller published an analysis with objectives of (1) developing a predictive model for the planted acreage of wheat and (2) obtaining a statistically accurate estimate of the impact of changes in land reserve acreage on the acreage of wheat planted (2, p. 30). They concluded that during the 1961-70 period each acre of additional land reserve (diversion) reduced total wheat plantings by about 0.61 acre. During the 1971-73 period each acre of wheat land reserve (set-aside) reduced planted acreage of wheat by 0.41 acre (2, p. 36).

These reported measurements reflect the concept of equation (1) above, except their measurements are in terms of planted rather than harvested acres. Ignoring this difference, slippage coefficients would equal 0.39 and 0.59 for the 1961-70 and the 1971-73 periods respectively.

Sharples and Walker reported results from an analysis designed to

account for the impact of two major factors on planted acreage in the North Central Region:[3] (1) change in crop rotations over time, and (2) cropland diversion. The overall purpose was to make short-run predictions of planted acreage of row crops (corn and soybeans) and extensive crops given various levels of land reserve acreage (4, p. 106). They reported the following predictive equation estimated from 1961-72 data (4, p. 109):

$$Y_r = 84{,}184 - 22{,}746\ (0.8748)^T - 0.621\ (\mathrm{DVRN}) + 1260\ (\mathrm{CRP})$$

where: Y_r = planted acres (in thousands) of row crops (corn and soybeans)

T = time expressed as 1961 = 1, 1962 = 2, ... 1972 = 12

DVRN = wheat, feed grain, and cotton diverted acres (in thousands)

CFP = a zero-one variable representing change of farm programs in 1971 that eliminated planting restrictions on individual crops (1961-70 = 0, 1971-72 = 1)

Their predictive equation shows that each land reserve acre reduced the acreage of row crops by 0.621 acre. The bulk of the land reserve was due to the feed grain program in the North Central area so the fact that wheat and cotton acreage was not included in the dependent variable, Y_r, but was included in the land reserve data would have little effect on the land reserve coefficient. The implied slippage coefficient would be 0.379. Less slippage would be expected in the North Central region compared to other regions in the U. S. because the North Central region has virtually no fallow and has a much higher percentage of land in farms classified as cropland compared to other regions.

Sharples and Walker estimated a similar equation for extensive crops

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[3]Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, Wisconsin.

(oats, wheat, barley, rye, flax, and hay). The DVRN variable had a coefficient of -0.124 indicating that land reserve also had some effect on these crops (4, p. 109). The sum of the two DVRN coefficients is 0.745. Slippage in the sense of equation (3) for all crops would be 0.255.

Houck and Ryan, in a report on the supply analysis of corn, define a diversion variable that combines diversion payment rates and eligible diversion acreage. They use this variable as an independent variable in an equation to explain diversion, and the same variable in an equation to explain the planted acreage of corn. They noted that the coefficient for this variable was about twice as large in the diversion equation as in the planted acreage equation (3, p. 190). Their appraisal of this difference was attributed to "slippage" and implies a slippage coefficient of roughly 0.5. Their analysis did not include any set-aside program years.

An unpublished analysis of factors affecting the cropland acreage farmers use for crops provides some additional insights into the magnitude of slippage (5). Cropland used for crops is defined to be the total acreage of cropland harvested plus the acreage of crop failure and the acreage of fallow. To define the total cropland inventory, two additional categories must be added to cropland used for crops (1) soil improvement crops and idle cropland and (2) cropland pasture.[4] Land reserve acreage should by definition be reflected as an addition to the soil improvement crops and idle cropland category and conversely as a direct acreage reduction in the cropland used category.

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[4] See (1, p. 2) for a breakdown of major land uses in the U. S.

Using data for the 1937-73 period the following equation was estimated:

$$L_t = 346.8 - \underset{(.002)}{0.60}\, D_t + \underset{(.006)}{0.29}\, PR_{t-1} \qquad R^2 = 0.95$$

where: L_t = total cropland used for crops (cropland harvested + crop failure + fallow), year t.

D_t = land in acreage reserve programs (includes both annual and long term programs), year t.

PR_{t-1} = the average annual parity ratio for the preceding year.

The numbers in parentheses are the standard errors of the estimated coefficients.

The model formulation uses the assumption that farmers plan their production response, including cropland use, on the basis of expected returns. The parity ratio is the ratio of the indexes of prices received to prices paid and measures the purchasing power of products sold by farmers in terms of things they buy compared to a base period. This variable lagged one year is used as an estimate of farmer's expectations for net returns for the current year. The land reserve variable picks up the effect that idled acreage has on cropland acres independent of net return expectations.

The estimated model equation explains a large percentage of the variation in total cropland used for crops. This model also reflects the slippage concept illustrated by equation (3) above. The implied slippage coefficient is 0.4.

Another indication of slippage is suggested by occurances since 1973. When set-aside requirements were reduced in 1973 and eliminated in 1974, the acreage of feed grains, wheat and soybeans which were in short supply did not increase proportionally to the acreage reductions in land reserves. In 1972, 230.9 million acres were planted to the seven major crops and

61.5 million acres were listed as idled by land reserve. In 1975 no land reserve provisions were operative, yet, the increase in planted acreage of the seven major crops was only 31.0 million acres compared to 1972, about half of the 1972 land reserve acreage. Commodity prices had substantially increased during this period, some to record levels, providing an added economic incentive for increased production.

These last two measures of slippage indicate that slippage is associated with total cropland as well as with individual crops. Land reserve acres have failed to remove a proportional acreage from crop production regardless of whether the consideration is for specific crops or crops in general.

Slippage will vary by year, crop and region, and will also be affected by different programs. Knowledge of how land reserve provisions are applied and simple reasoning indicates that the acreage level of land reserve also affects the slippage coefficient. Slippage would be largest with small land reserve requirements and would decrease as the total acreage of land reserve is increased. This follows simply because if the land reserve requirement is large enough a farmer would be forced to reduce his acreage of major crops by one acre for each additional acre of land reserve. Slippage coefficients for individual crops are greater than coefficients that pertain to a group of crops or to cropland used for crops.

The empirical evidence that is available indicates that on the average past land reserve programs have been only 50 to 60 percent effective in reducing crop acreage from what that acreage would have been in the absence of land reserve provisions. Relatively, wheat programs have resulted in more slippage than have feed grain programs. Shifting the

concept of land reserve from diversion to set-aside increased the slippage problem.

Productivity of Land Reserves

A study of the productivity of diverted cropland published in 1969 concluded that the productivity of the diverted acreage as a percentage of the acreage in production, was 90 percent for wheat, 85 percent for grain sorghum, 83 percent for barley, 82 percent for corn and 80 percent for cotton (8, pp. 14-15). The constitutes a slippage factor in addition to the acreage slippage discussed above. Equation (2) illustrated a slippage concept that includes yield (productivity).

No studies were found that examined how nonparticipants adjust when participants maintain land reserve acres. Their behavior, if as suggested above, would also have an effect on slippage.

Reasons for Occurence of Slippage

Why does slippage occur? A definitive answer would require careful study of annual program provisions and how these provisions apply on individual farms. Obvious observations can be made, however. Land normally not counted as part of the cropland inventory may qualify as land reserve acreage. In this case available cropland acreage is not reduced proportionally which allows crops other than those with acreage maximums to continue to be grown.

Many farms have land in the cropland inventory that is regularly left idle or abandon after planting. Fallow is an obvious example but there are other situations such as flooding, high water tables, alkaline soil conditions, small isolated tracts, and high incidence of crop failure in drouthy areas. Designation of land regularly idled anyway as land

reserve will have no effect on final crop acreage. One reason a large slippage coefficient is associated with wheat is because land that would be fallowed under normal circumstances has qualified as land reserve resulting in no net effect on final wheat acreage.

BASES AND ALLOTMENTS AND RIGIDITIES IN PRODUCTION

Most U. S. farms have allotments and/or bases assigned to them on the basis of historical cropping patterns. In order to maintain the assigned level of the allotment or base farmers have generally been required to maintain an acreage of the allotment or base crop each year that is at least 90 percent of the allotment or base. Most farmers have tried to maintain their allotment or base acreages because income support payments are directly related to allotment and base acreage.

The acreage of land to be idled under annual land reserve provisions has historically been calculated as a percent of the particular base or allotment assigned to a farm. When marketing quotas are in effect the allotment becomes the upper limit on acreage for the particular crop for all farmers. Under voluntary programs only participating farmers are limited to planting within their allotment or base acreage.

The required planting provisions tended to lock in production patterns leading to possible production inefficiencies as price relationships and technical possibilities changed over time. In 1964 substitution provisions for wheat and feed grains went into effect allowing farmers with both a wheat allotment and a feed grain base to plant either wheat or feed grains to preserve history. Farmers still had to plant within the total of the base and allotment if they were participants. The Act of 1970 introduced

the set-aside concept which removed the upper acreage limits and in place of upper limits relied only on the maintenance of the conserving base acres plus a set-aside land reserve as the production control mechanism. Bases and allotments still had to be planted to specific crops or designated substitutes to maintain history. The Act of 1973 which continued the set-aside concept included cotton in the substitution provisions and also added a list of other crops that could be substituted to preserve base and allotment history. In comparison to past programs, the Act of 1973 provided producers more freedom in decision making as to the mix of crops that could be grown.

Conserving Base

The conserving base is yet another base assigned to farms based on historical land use that is important in understanding and evaluating land reserve programs. The conserving base applies to those crops that are soil conserving as opposed to soil depleting. The conserving base is justified on the basis of soil conservation as well as being a program provision factor in production control. Typically the conserving base reflects a historical acreage of fallow, cropland pasture, tame hays and forages, soil improvement crops, and idle land.

Whenever land reserve provisions have been in effect there has been a requirement that farmers maintain an acreage of soil conserving crops equal to their assigned conserving based in addition to any land reserve acreage. The requirement to maintain the conserving base was to prevent farmers from reducing conserving crops in order to meet land reserve requirements or conversely to prevent farmers from reducing conserving crops in order to be able to maintain the acreage of major crops

which were under production control.

Like the other bases and allotments, the conserving base tended to lock in production patterns on farms which could result in production inefficiencies as price relationships and production techniques changed. This rigidity was recognized and conserving bases were reduced over time. The reduction in total conserving crop requirements is generally accepted although data series to thoroughly document this reduction are not available.

Sharples and Walker, as already noted in the same study discussed above, reported a predictive equation for estimating the acreage of extensive crops (4, p. 109):

$$Y_e = 25{,}167 + 26{,}828\ (0.9276)^T - 0.124\ (DVRN)$$

where: Y_e = planted acres (in thousands) of extensive crops[5]

T = time expressed as 1961 = 1, 1962 = 2, ... 1972 = 12

DVRN = wheat, feed grain, and cotton diverted acres (in thousands)

This equation shows that the extensive crop acreage in the North Central region declined over time. The bulk of the reduction came in hay and oats. Hay is a conserving base crop and oats may have been considered a historical conserving base crop depending on how it was harvested locally. The shift from extensive crops to intensive crops as measured by Sharples and Walker parallels the reduction in the conserving base. Their equations illustrate another point in connection with slippage. In addition to the slippage connected with land reserve acres for each year the equations also show that a given level of land reserve was less effective in 1972 for controlling intensive program crops than the same acreage was in 1961. Further,

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[5] Oats, wheat, barley, rye, flax and tame hay.

the intensive crop equation, through the CFP variable, shows the effect of changing to the set-aside concept of land reserve in 1971. The land reserve acreage (DRVN) would have to be increased by 2,029 thousand acres after 1970 (1,260 ÷ 0.621) to offset the structural program shift.

The conclusion from this is that there has not only been slippage for any given year but that there has been a loss of effectiveness over time in the ability of land reserve acreage to control acreage of surplus production crops.

The use of substitute crop provisions, the shift to the set-aside concept, and the reduction in the conserving base have substantially reduced the production pattern rigidities imposed by the historical bases and allotments. Provisions to reduce the rigidity problem contributed to the slippage problem

Comparison of Cropping Patterns with Bases and Allotments

Another problem with the historical bases and allotments is that income support payments such as deficiency payments are based on bases and allotments. Because of this a farmer can receive a payment based on a crop that is no longer a major crop or even grown on his farm. If the intent on the part of policymakers is to associate payments, whether these payments are income support or compensation for production adjustment, with a particular crop then relaxation of the association between a base and allotment and a particular crop could pose difficulties in administering a program especially if the program was aimed at a particular crop.

The following statements based on 1973 participant data provide an indication of the difference between cropping patterns and the assigned bases and allotments: (6, p. 168-169 and 264)

A. Corn

1. Farms with a corn base had 77.0 million acres of base and planted 56.1 million acres of corn.

2. Thirty-five percent of the farms with a corn base planted no corn. Those farms had 11.9 million acres of corn base.

3. The corn base was over planted by 200 percent or more on 3.3 percent of the farms. Those farms had 1.3 million acres of base and planted 3.8 million acres of corn.

B. Grain Sorghum

1. Farms with grain sorghum base had 21.8 million acres of base and planted 14.9 million acres of grain sorghum.

2. Forty-eight percent of the farms with a grain sorghum base planted no grain sorghum. Those farms had 6.7 million acres of base.

3. The grain sorghum base was overplanted by 200 percent or more on 7.1 percent of the farms. Those farms had 664 thousand acres of base and planted 3.7 million acres of grain sorghum.

C. Barley

1. Farms with a barley base had 15.3 million acres of base and planted 7.9 million acres of barley.

2. Sixty-seven percent of the farms with a barley base planted no barley. Those farms had 6.9 million acres of base.

3. The barley base was overplanted by 200 percent or more on 4.9 percent of the farms. Those farms had 530 thousand acres of base and planted nearly 1.8 million acres of barley.

D Wheat

1. Farms with a domestic wheat allotment had 17.8 million acres of allotment (the domestic allotment is roughly one-third of the total wheat allotment) and planted 49.7 million acres of wheat.

2. Forty-five percent of the farms with a wheat allotment planted no wheat. Those farms had 2.6 million acres of allotment.

3. The wheat allotment was overplanted by 400 percent or over on 16.9 percent of the farms. Those farms had 3.8 million acres of domestic allotment and planted 21.4 million acres of wheat. (Farmers would normally overplant the domestic allotment by a factor of 3 if allotments and plantings were completely consistent).

E. Cotton (based on 1972 data) (7, p. 437)

1. Farms with a cotton allotment had 10.2 million acres of allotment and planted 13.8 million acres of cotton.

2. Only 1.3 percent of farms with a cotton allotment planted no cotton. Those farms had 31,000 acres of cotton allotment.

3. The cotton allotment was overplanted by 200 percent or more on 9.2 percent of the farms. Those farms had 866 thousand acres of allotment and planted 2.4 million acres of cotton.

A PROPOSED LAND RESERVE PROGRAM

If future supply and demand conditions require the use of land reserve to control supply the problem of slippage will be encountered if provisions are structured in the same manner as during the 1956-1973 period. The rigidities encountered in the use of historical bases and allotments have been reduced, but as a consequence base and allotments may no longer be related to production patterns that now exist on individual farms. A proposal for redefining crop bases and for administering a land reserve is developed in this section which attempts to reduce both the slippage and rigidity problem.

This proposal assumes that a voluntary land reserve program would be implemented annually, as needed, as a method of selectively reducing the production of commodities that have a potential surplus. Land reserve provisions should be designed to minimize slippage and to maximize efficiency of production on non-reserve acres. Acres idled with minimum slippage would reflect a potential intermediate term commodity reserve more accurately and the cost effectiveness would more nearly reflect the desired mix of production adjustment payments and income supplement

payments (if any).

Crop bases are needed to establish a reference point for determining the level of land reserve required of each participant as a fair share of the total land reserve requirement. Bases may also be used for allocation of support payments.

This proposal modifies the procedure for setting historical bases and allotments and eliminates the conserving base. A farm's production pattern the previous year would be the base for making production adjustments in the current year. The production pattern for each farm would be reported annually by the farmer to the county Agricultural Stabilization and Conservation Service (ASCS) office.

If program administrators determined a land reserve was needed, participating farmers would be required to limit their acreage of the specific crop to a certain percentage of their base. The base would be last year's acreage. In addition, participants would be required to certify an acreage of land reserve equal to the difference between the base acreage and the allowed planting. A further requirement would be that the land reserve acreage be on land that had been planted to the controlled crop in the previous year. The crop base for a controlled crop for the next year would be the allowed acreage plus the land reserve in the present year.

The proposed method of redefining crop bases does not relieve the program administrator from the task of determining the expected participation rate for the program announced. The base is last year's planted acreage or planted acreage plus land reserve if a land reserve program had been in effect. An announcement of land reserve program provisions would indicate an upper acreage limit as a percent of the base and a percentage of the base to be devoted to the land reserve. The two percentages would

add to 100 percent.

Obviously a high participation rate makes a program's effect more predictable. A low participation rate requires a larger adjustment to be made by participants and also makes the program effect harder to predict because of the adjustments nonparticipatns may make in response to the program. Achieving higher voluntary participation rates requires greater economic incentives. Kinds and levels of incentives are not considered in this paper.

Examples to Illustrate the Proposal

Six example farms are depicted in Figure 1 to illustrate how the proposed method would function. For example purposes, participants would be required to limit corn acreage to 85 percent of their corn base and wheat acreage to 75 percent of their wheat base. Conversely land reserve requirements are 15 and 25 percent of their corn base and wheat bases, respectively.

Farmer A participates and puts 15 percent of his corn land into land reserve as required. A's corn base for year t+1 would be the same as for t. Farmer B participates and puts 25 percent of his wheat land in land reserve. The land reserve is placed on base wheat land and the acreage of wheat plus land reserve does not exceed the base acreage. An additional requirement that would logically be imposed is that a participating farmer such as B who did not have a corn base would not be able to grow corn in year t if corn production was also under production controls. B could grow a noncontrolled crop such as cotton (Figure 1), establishing a cotton base for year t+1. B could also grow corn if he were a nonparticipant. Wheat, soybeans and cotton could be grown anywhere on B's farm.

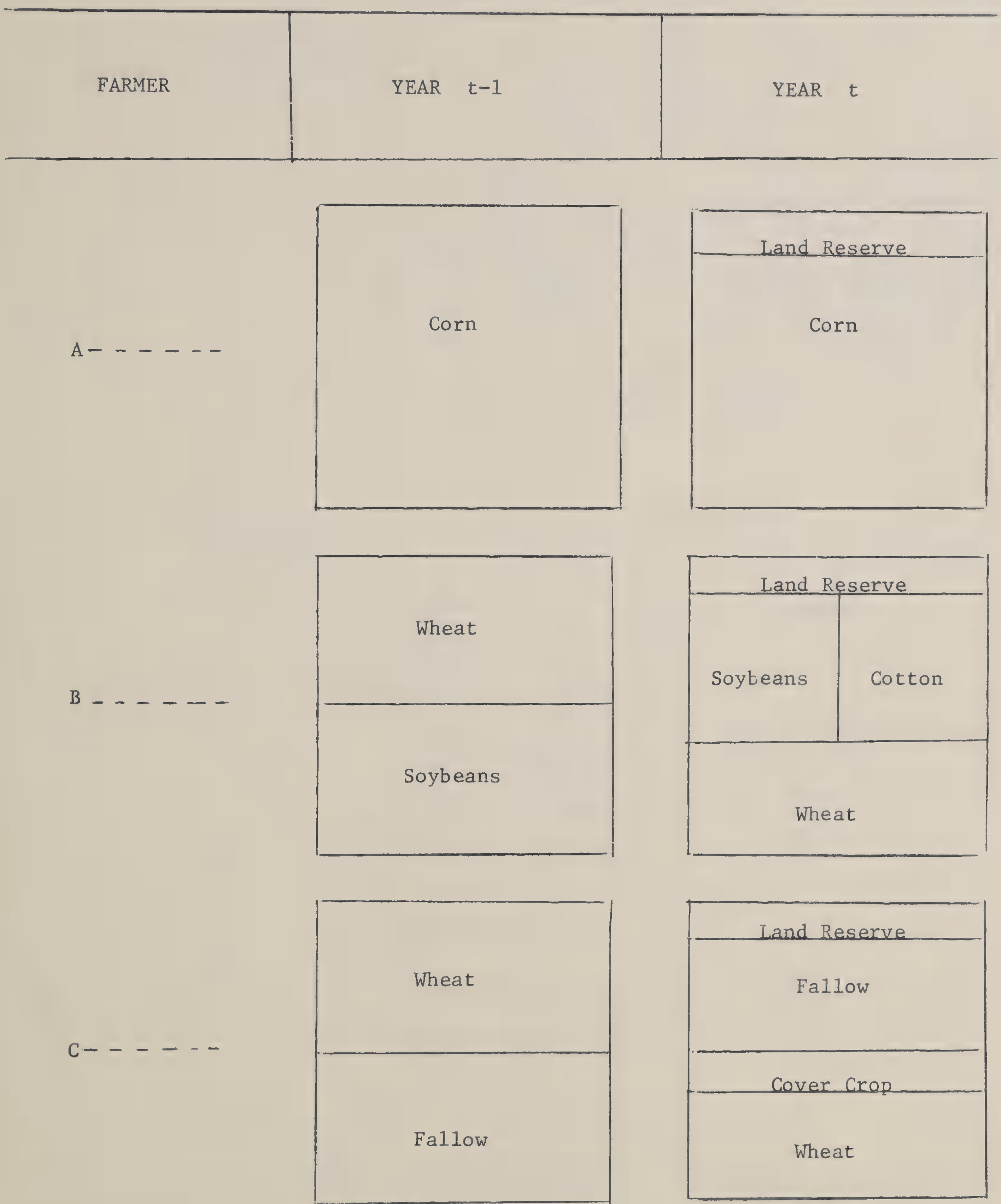

FIGURE 1 Example Farm Organizations for Years t-1 and t

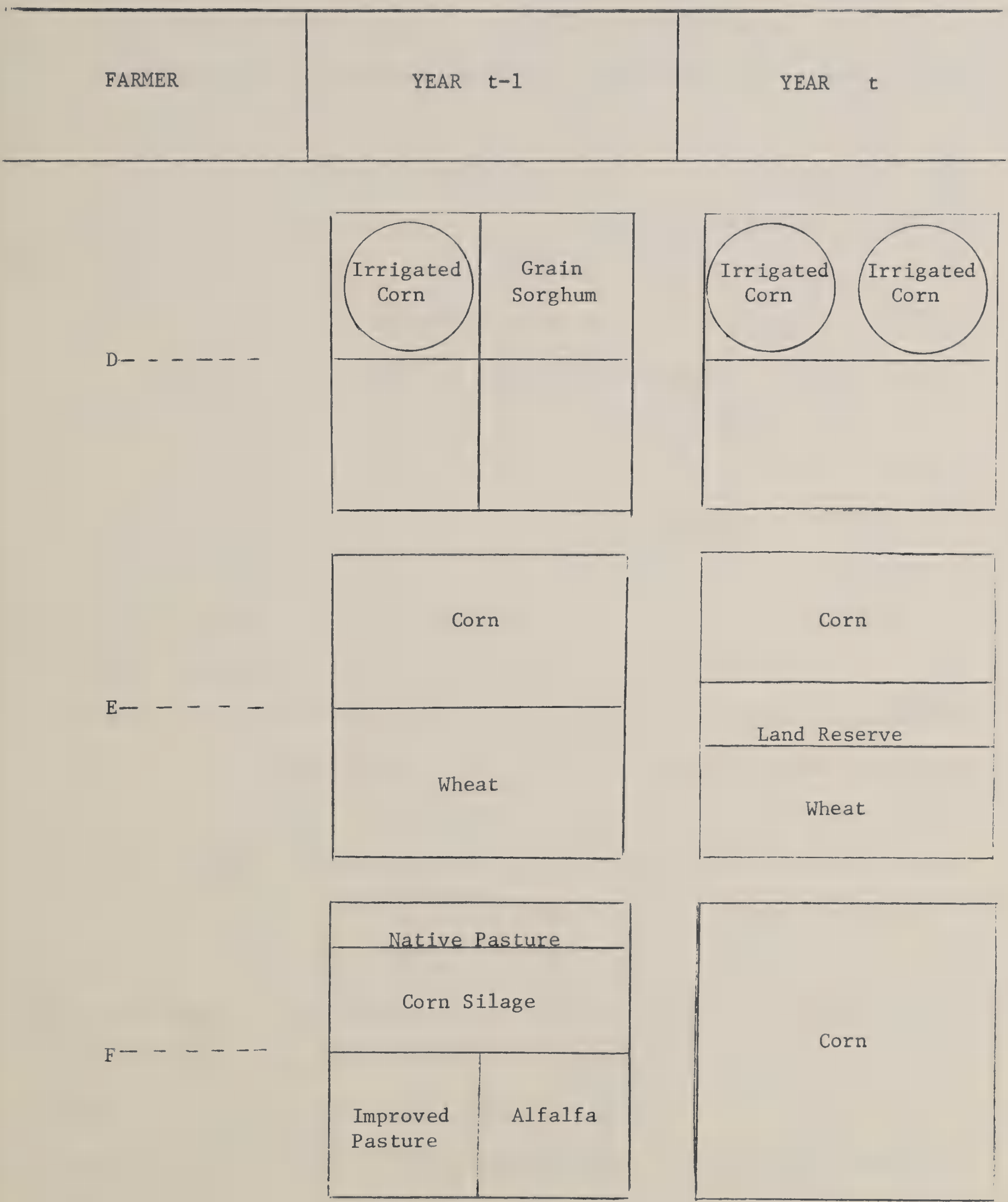

FIGURE 1 Continued - Example Farm Organizations for Years t-1 and t

Farmer C operates a wheat-fallow rotation. If he participates he would be required to have a land reserve on the land in wheat in year t-1. He could not harvest an acreage of wheat plus land reserve in year t that would exceed the wheat base established in year t-1. The land fallowed in year t-1 would have to be planted to a cover crop in t. The cover crop might be wheat, but Farmer C would have to certify in some way that he did not harvest the cover crop portion; e.g., clipping the heads before they ripen or tilling the cover crop land before the wheat ripened.

Farmer D's corn base would equal one-fourth of his cropland based on his organization in t-1. Suppose he wanted to install another center-pivot irrigation system in order to double his corn acreage. By being a nonparticipant in year t, he could expand his corn acreage and increase his base commensurate with his desired production plan. D could also eliminate wheat from his cropping plan and switch to grain sorghum. D's year t organization is reported to ASCS and he would be eligible to participate in any program in year t+1. His bases have changed considerably from what they were in year t-1. Under the existing base and allotment system, D would likely have a feed grain base, a wheat allotment and a conserving base. These bases and allotments would no longer fit his desired organization. If he were to participate in a program using the historical allotments and bases he could either be forced to adjust his organization to conform more closely with the historical bases and allotments or else he would be receiving payments based on a crop he no longer grows. Under the method proposed here D would be able to adjust his organization and bases by being a nonparticipant for one year at most, or if no production adjustment provisions had been in effect in year t, he could have adjusted his bases without foregoing any possible benefits.

Farmer E provides an example for another logical regulation that would require a farmer growing two controlled crops to either establish a land reserve for both crops or else remain a non-participant.

An example of a situation where a farmer desires to shift from a livestock operation such as dairy farming to a crop operation is depicted by Farmer F. F would likely have had a small feed grain base, a very large conserving base, and an acreage of tillable native pasture. In year t he sells his herd and switches to a corn for grain organization. He could do this, report his corn acreage and establish a corn base for year t+1. F would be adding land to the cropland base.

Evaluation of the Proposal

The proposed method of setting bases and of controlling production through use of a land reserve should minimize interference with producer response to market signals. When production control is needed it can be accomplished through a level of reserve where the reduction base is from the most recent level of resource allocation. Farmers always have the option of readjusting their production base to conform to their interpretation of market signals. They may have to forego participation for one year but there is no long-run penalty for making the adjustment such as a permanent loss or reduction of an allotment or base.

A justification for using historical bases and allotments year after year was to channel benefits to farmers and to areas that had a cropping history and to prevent farmers who had no history of production from acquiring a base or allotment in order to share in the program benefits. To the extent that a farmer desired to grow a program crop on the basis of acquiring payment benefits rather than on the basis of production efficiency

and effective market demand the argument for historical bases and allotments has validity. An argument against annual adjustments of bases would be less compelling if policymakers were to take the view that farmers should rely on the market place for their income and that payments should be compensation for voluntarily making adjustments, including an amount for participation incentive.

Another point to consider is whether annual adjustment in bases would cause farmers to distort their production patterns to try to adjust their bases to their own advantage. Ideally the fact that the present year's acreage will be next year's base would have no effect on the production pattern. This is not likely to be the case. The degree of influence on production patterns will depend on the benefits that go with a base. Production distortions should be minimal if a base is used for production adjustment and the payment is adequate compensation for the adjustment. Farmers would certainly try to maximize their base if large income transfer were tied to the base or on the other hand they would try to minimize their base if required adjustments were not fully compensated. The structure of the entire program is a factor in determining the how well annual adjustments in bases might work.

A "n" year moving average could be used to adjust bases where the acreage from the most recent year is added and the acreage from the most distant year is dropped from the averaging equation. This would make base adjustments more gradual.

The dual requirements that land reserve acreage be allocated to land used to grow the crop in the previous year and that the total acreage of the controlled crop be limited are required to reduce slippage. In one

sense this introduces fairly rigid controls. These requirements likely would be acceptable to farmers only in the case where their base acreages accurately reflected their desired organization.

SUMMARY AND CONCLUSIONS

Perusal of research dealing with the effect of land reserve acreage on acreage of controlled crops leads to the conclusion that land reserve acres have not been fully effective in reducing production of surplus crops. Slippage has been defined in this paper as the proportion of the land reserve acre that shows no compensating reduction in the crop(s) being controlled. Slippage as defined has a magnitude in the 0.4-0.5 range meaning that past land reserve programs have in general been only 50 to 60 percent effective in reducing acreage. Slippage obviously increased over the 1956-73 duration of land reserve programs. The productivity of land reserve acreage was also less than the acreage being cropped according to estimated yield comparisons.

Allotments and bases including the conserving base can impose production pattern rigidies on individual farms local areas, and regions. Substitution provisions and a reduction in conserving bases were used to reduce rigidities but these adjustments increased the slippage problem.

The proposal to establish farm program bases, based on the previous year's organization is designed to make production adjustments through land reserve more efficient by reducing slippage and to minimize impediments to farmers for making desired organization adjustments. If most of the slippage could be eliminated from land reserve acres, these acres would be more representative of actual land reserve. The requirement that

land reserve acres be on land actually used for the crop being adjusted in the previous year should assure that the productivity of these acres would more nearly equal the cropped acreages than was true in the past.

If large income supplements are tied to annually updated bases, there could be an incentive to be a nonparticipant one year in order to establish a large base. This possibility has to be considered in this proposal although it may be less of a problem if income supplements vary from year to year as they do under the current program with deficiency payments. If payments vary the farmer would have to gamble that payments would be large the year(s) following his adjustment. In this case the expected payoff may not be large enough to justify second guessing the value of a larger allotment apart from adjusting acreages in response to market expectations.

REFERENCES

(1) Frey, H. Thomas, Major Uses of Land in the United States, Summary for 1969. Agr. Econ. Rpt. 247, ERS-USDA, Dec. 1973.

(2) Garst, Gail D. and Thomas A. Miller, "Impact of the Set-Aside Program on the U. S. Wheat Acreages," Agricultural Economics Research, Vol. 27, No. 2, April 1975, pp. 30-37.

(3) Houck, J. P. and M. E. Ryan, "Supply Analysis for Corn in The United States: The Impact of Changing Government Programs," Am. J. Agr. Econ., Vol. 54, No. 2, May 1972, pp. 184-191.

(4) Sharples, Jerry A. and Rodney Walker, "Shifts in Cropland Use in the North Central Region," Agricultural Economics Research, Vol. 26, No. 4, October 1974, pp. 106-111.

(5) Unpublished research by Milton H. Ericksen, Agricultural Economist, U. S. Dept. of Agr. and by James W. Richardson, Research Associate, Oklahoma State University, Stillwater, OK, 1975.

(6) U. S. Department of Agriculture, ASCS, Frequency Distributions of Participating Farms in 1973 Feed Grain, Wheat, and Cotton Set-Aside Programs, Data Systems Division, Apr., 1974.

(7) ____________. ASCS, An Analysis of the 1972 Set-Aside Programs, Data Division, January 1973.

(8) Weisgerber, P., Productivity of Diverted Cropland ERS-398, April 1969.